

1872, and afterwards copied into *Nature*, Sept. 19, 1872, the following passage occurs:—"But a well-boring at Winwick, after penetrating 150 feet of Red Sandstone, the upper part of which is placed with the pebble beds in the Geological Survey sheet, was sunk 210 feet through strata consisting of hard rock, stiff red marl, red and white sandstone, *with a zone of limestone bands* at the base, the boring terminating at 360 feet from the surface, in hard rock."

In this letter the possibility of finding workable coal under the Trias is fully discussed. I further observed that I "was inclined to think" that these beds "belong to the Permian rather than to the Upper Coal-measures." The borings through the Trias at St. Helen's have been made since this letter was written.

PARK CORNER, BLUNDELLSANDS,
Nov. 9th, 1881.

T. MELLARD READE.

DR. CALLAWAY'S VIEWS ON ANGLESEY GEOLOGY.

SIR,—At page 423 of the September Number of this MAGAZINE, Dr. Callaway states, speaking of the Geology of Anglesey, "that *in no case* are there any signs of a transition between the altered and unaltered beds." It is not quite clear to what beds he refers as altered or metamorphic beds; but if he has in view, as I imagine he has, the great gnarled series of Anglesey, which occupies the whole northern part of the island, I venture to take serious exception to his statement. This area of so-called metamorphic rock is represented on the Survey Map as bounded on the south by a great curved fault. On the coast at Porth Corwg, near Point Ælianus, where the fault is represented as running out to sea, a fault undoubtedly does occur, and the gnarled beds are there seen to rest against the shales. As far as I know, this fault is actually seen nowhere else. It has been assumed to exist, as the most plausible explanation of the stratigraphy of the district, and has been so indicated on the map. There are various circumstances which suggest that the line laid down on the map is not the line a great fault would take, and I am in a position to state that no fault occurs at two points (at any rate) of the line indicated; for a distinct passage can be seen and traced inch by inch from the fossiliferous shales to the beds marked "altered Cambrian" on the Survey Map, and which Prof. Hughes calls the "gnarled series." This passage is shown on the slopes of the north side of Pare's Mountain, where bare rock crops out at the surface for some distance, and the character and texture of the rocks can be distinctly observed. Also at Hafod-onen, near Rhosgoch Station, where, on the bared surface of the farm-yard, the two series can be seen passing into one another, the one dipping under the other. I do not assert that fossiliferous Cambrian shales pass into metamorphic rocks, but I do assert that I have seen such shales pass into beds which Dr. Callaway has included under the head metamorphic. If the term metamorphic is used in any strict sense as implying a re-arrangement and crystallizing of mineral constituents, I do not see how it can be applied indiscriminately to the "gnarled series." Parts of the Llandoverly

beds of Central Wales are quite as metamorphic-looking as much of the "gnarled series" of Anglesey. We are presented in that island with as complicated a piece of geology as Great Britain can show, and no little field-work must be patiently prosecuted before the problems can be solved.

According to my view, Dr. Callaway has misapprehended some of the most important sections. In a short paper printed in this *MAGAZINE* last March, I pointed out that the Nebo sections described by him as unconformable junctions of "Ordovician shales" on granitoidite are really faulted junctions of shales against the basement bed of the Cambrian. This at Nebo is a very compact fine-grained grit, which Dr. Callaway has mistaken for granitoidite. At Bryngwallen quarry, near Llanerchymedd, a precisely similar grit may be seen passing down into a quartz conglomerate not distinguishable from that of Twt Hill, and passing up into a fossiliferous sandstone containing *Orthides*, the whole section included in some 30 or 40 feet.

R. D. ROBERTS.

CLARE COLLEGE, CAMBRIDGE, *Nov. 7, 1881.*

THE "LOWER KEUPER SANDSTONE" OR "BASEMENT BEDS."

SIR,—While thanking Mr. Wilson for his support of much that I have said on these rocks, I must correct a slight misapprehension with regard to my views. I do not hold the "theory of a great break" at the base of the Waterstones attributed to me, but merely point to the recurrence of lines of erosion at this and other horizons in the Trias to show that they are no evidence of want of conformability; on p. 6 I use the words "though there is no unconformability," etc.

I do, however, believe that a great change of physical conditions commenced at this period, and that, judging by its effect upon the nature and distribution of the deposits, this was the most important change that took place in the British region during the Triassic era. For I consider the theory that the Bunter was upheaved into dry land and denuded, before the Keuper was deposited, far from being proved.

Mr. Wilson states that "At the close of the Bunter period elevation took place, in the Midlands certainly, if not generally throughout the country, accompanied by extensive and long-continued denudation." The evidence for this elevation and denudation consists in the fact that the Keuper Basement Beds rest on Pebble Beds near Nottingham, but on Lower Mottled Sandstone at four miles distance, the inference being that at least 200 feet must have been denuded away.

But it must be borne in mind that the Bunter deposits thin away to the south-east, as though deposited against a shelving shore, and that Nottingham stands on the margin of the area over which these shingles were originally spread. The inference therefore that the Pebble Beds must have been denuded away in those places where they are absent below the Keuper is unsafe, for they probably never extended so far. It is true that the disappearance of the Pebble